1887MNRAS..47..421D

D'Arrest	1861-64	$\Delta\alpha = 8^{\mathrm{s}}{\cdot}2$	$\Delta\delta = 62''$	3 nights.
Schönfeld	1861	9·72	59·5	5 „
Schultz	1863-65	9·05	61·0	3 „
Schönfeld	1864	9·38	71·3	1 night.
Vogel	1869	9·38	69·0	2 nights.
Dreyer	1877	8·92	60·7*	1 night.
Dreyer	1885	8·86	66·0	1 „

III. 855–856 = *h* 2294–2295.—These also occur in M. Flammarion's list, because W. Herschel in 1790 *estimated* the position-angle = 60° and the distance 60″, while d'Arrest found 50° and 43″. The objects are both excessively faint, and it would be easy to count up hundreds of similar discrepancies. In 1872 the angle and distance were measured at Birr Castle, and found = 51°·0 and 61″·5.

I have spared no trouble in going through these cases one by one, although in some the evidence was of such a character as hardly to deserve a refutation. I would suggest to anybody who in future should feel inclined to lay a case of proper motion or variability of a nebula before the public, first to peruse the remarks of d'Arrest in the *Astr. Nachr.* vol. lvii. col. 342. In making micrometric observations of these interesting objects we must be content to work for unborn generations, or at least not to expect immediate and startling results, which would look well in popular books.

Armagh Observatory:
1887, *May.*

Note on the Effect of Refraction in Stellar Photography.

By J. L. E. Dreyer, Ph.D.

In his paper read at the April meeting of the Society, Mr. Grubb has assumed that a displacement of 0″·5 is the smallest which would sensibly affect the symmetry of the image of a star on a photographic plate. It is of interest to see how soon refraction will move the image to this extent, assuming the action of the clock to be absolutely perfect and the instrument accurately adjusted.[†]

The well known expressions for refraction in Right Ascension and Declination, first given by Bessel in the *Monatliche Correspondenz*, xvii. p. 214, are

$$57''\frac{\tan t \sin\psi}{\cos\delta \sin(\psi+\delta)} \quad \text{and} \quad 57'' \cot(\psi+\delta)$$

---

[*] In the single measure of distance at Birr Castle on Oct. 29, 1877, there is an obvious error of one revolution of the screw = 65″·1.

[†] This question is not considered in Prof. Pickering's valuable paper, "Investigation in Stellar Photography."

1887MNRAS..47..421D

where ψ is determined by $\tan\psi = \cos t \cot\phi$, while t is the hour-angle, δ the Declination, and ϕ the latitude. The rate of change of refraction is found by differentiation with regard to t.

$$\frac{da}{dt} = 57''\left(\frac{\cos\psi}{\sin(\psi+\delta)\tan\phi}\right)^2 (1 + \tan\phi\tan\delta\cos t)$$

$$\frac{d\delta}{dt} = 57''\left(\frac{\cos\psi}{\sin(\psi+\delta)}\right)^2 \cot\phi\sin t$$

The trail left on the plate after an exposure of n seconds of time will now be the resultant of the displacements along the parallel and the hour-circle equal to

$$\frac{15n}{206265}\frac{da}{dt}\cos\delta \quad \text{and} \quad \frac{15n}{206265}\frac{d\delta}{dt}$$

Assuming the latitude = 50°, the following table shows the values of these quantities for various parts of the sky for a change of 4^m, or 1° in hour-angle.

$t =$	0^h		1^h		2^h		3^h		4^h	
	$da\cos\delta$	$d\delta$	$da\cos\delta$	$d\delta$	$da\cos\delta$	$d\delta$	$da\cos\delta$	$d\delta$	$da\cos\delta$	$d\delta$
$\delta =$ 0°	0″·99	0″·00	1″·07	0″·33	1″·33	0″·79	1″·99	1″·68	3″·98	4″·10
+25°	0·71	0·00	0·73	0·16	0·81	0·36	0·96	0·64	1·26	1·12
+50	0·64	0·00	0·64	0·13	0·66	0·28	0·69	0·45	0·72	0·67
+75°	0·71	0·00	0·70	0·16	0·66	0·31	0·60	0·47	0·51	0·63

The value of $da\cos\delta$ increases with south declination, being on the meridian and at $-10° = 1''\cdot28$, and at $-20° = 1''\cdot87$. Refraction accelerates the rising of a star, so that the apparent place of a star in the east will be in advance of the true one, but the difference of hour-angle gradually diminishes as we approach the meridian. After the culmination they change places, the apparent place now being behind the true one. A slight uniform retardation of the clock will thus do away with the greater part of the error in the direction of the parallel, as the table shows how very slowly $da\cos\delta$ changes with the hour-angle. The case is different with regard to the effect of refraction along the hour-circle, as the full amount of the change in this will cause displacement of the star on the plate, and it seems that a declination clock will ultimately become desirable, though the mechanical arrangements would be somewhat complicated if the instrument were to be available for lengthened exposures on any part of the sky. But this would be unnecessary in the case of systematic work, such as star-charting, as this could always be carried on close to the meridian, where the refraction in declination changes very slowly. Thus, for the latitude of 50° an equatoreal star will be 27^m past the meridian, and a star of +25° Declination 39^m past the meridian, before a displacement of $0''\cdot5$ occurs.

1887MNRAS..47..421D

The Right Ascensions of certain Stars within Ten Degrees of the Pole. Reduced from Observations by F. G. W. Struve.

By Henry Lefavour.

(*Communicated by Prof. T. H. Safford.*)

The observations from which the following star-places have been determined were made by Struve, at Dorpat in 1818 and 1819, and are published in the second volume of his "Dorpat Observations." The list includes all the stars that he observed which lie within ten degrees of the pole, with the exception of *Polaris*, the observations of which have already been reduced, and the stars which he designated as *Anonymа*, most of which are unimportant, and were observed but once, or at the most two or three times. The Right Ascensions are reduced to 1820·0, but no proper motions have been applied, and the epoch is consequently given for each star.

Catalogue of Mean Right Ascensions for 1820·0.

No.	Struve's Name.	Gr. No.	Misc. Cat. and No.	No. of Obs.	Mean Right Ascension for 1820·0. h	m	s	Epoch.
1	Cephei 320	67	...	3	0	19	46·097	1818·9
2	Ursæ Minoris 1	144	Bradley 65	9	0	39	10·712	1819·6
3	α Cephei 321	177	...	1	0	45	53·920	1818·9
4	Cephei 322	195	Bradley 95	1	0	48	21·260	1818·9
6	Rangiferi 15	424	...	3	1	47	55·007	1818·8
7	Rangiferi 16	426	...	2	1	48	33·430	1818·8
8	Rangiferi 21	505	...	1	2	12	33·640	1818·8
9	Rangiferi 23	527	...	2	2	22	35·215	1818·8
10	Rangiferi 26	580	Bradley 396	3	2	44	34·127	1818·9
11	Rangiferi 29	595	Bradley 402	2	2	51	33·490	1818·8
12	Rangiferi 323	642	...	4	3	8	58·663	1818·9